

PATENT

Attorney Docket No. A-6871742/RMS/VEJ
Attorney Matter No. 469249-00078
Application No: 09/881,052

In the Claims:

Please cancel claims 1-31 without prejudice and disclaimer, and add claims 32-88 as follows. All pending claims, whether or not amended, are presented below for the Examiner's convenience and will replace all prior versions, and listings, of claims in the application:

1-31. (Cancelled)

32. (New) An apparatus for dispensing liquids into a reaction vessel, said apparatus comprising:

a rotor mounted for rotation about a central axis, said rotor carrying an array of reaction vessels along a circular path;

a liquid dispenser including a plurality of dispensing nozzles, said liquid dispenser positioned above said rotor and arranged for movement to align said dispensing nozzles with a plurality of said reaction vessels and dispensing liquid from each dispensing nozzle into a respective reaction vessel; and

a controller for synchronizing said liquid dispenser and said rotor such that two or more of said plurality of dispensing nozzles each dispense liquid into two or more respective reaction vessels simultaneously.

33. (New) The apparatus of claim 32 wherein said liquid dispenser is arranged for movement along a portion of said circular path.

34. (New) The apparatus of claim 32 wherein said apparatus is configured for chemical synthesis and said liquid dispenser is fluidly coupled with one or more reagent sources.

35. (New) The apparatus of claim 34 wherein said apparatus is configured for synthesis of oligomers.

36. (New) The apparatus of claim 32 wherein each said nozzle comprises a dispensing valve controlling liquid delivery thereto, wherein said controller is configured to

PRELIMINARY AMENDMENT

2 of 10

(1117372)

PATENT

Attorney Docket No. A-68717-2/RMS/VEJ
Attorney Matter No. 469249-00078
Application No. 09/881,052

simultaneously synchronize movement of said rotor and said liquid dispenser and control of said dispensing valves.

37. (New) The apparatus of claim 36 wherein at least one of said dispensing valves comprises an electric solenoid valve.

38. (New) The apparatus of claim 32 further comprising a plurality of linear actuator operably connected to said liquid dispenser for effecting movement of said liquid dispenser.

39. (New) The apparatus of claim 38 wherein said controller is configured to actuate said linear actuator such that said plurality of dispensing nozzles move along said portion of said circular path along with said respective ones of said reaction vessels.

40. (New) The apparatus of claim 32 further comprising a rotary actuator operably connected to said liquid dispenser for effecting movement of said liquid dispenser.

41. (New) The apparatus of claim 38 wherein said controller is configured to actuate said rotary actuator such that said plurality of dispensing nozzles move along said portion of said circular path along with said respective ones of said reaction vessels.

42. (New) The apparatus of claim 32 wherein said controller is configured to actuate said nozzles and dispense fluid while said rotor is moving along said circular path.

43. (New) The apparatus of claim 42 wherein said controller is configured to actuate said nozzles and dispense fluid while said dispenser head is moving along said circular path.

44. (New) The apparatus of claim 32 wherein said plurality of dispensing nozzles are linearly arranged in a pattern corresponding to a radial column of said array of reaction vessels.

PATENT

Attorney Docket No. A-68717-2/RMS/VEJ
Attorney Matter No. 469249-00078
Application No. 09/881,052

45. (New) The apparatus of claim 32 wherein said liquid dispenser is a multi-channel dispenser.

46. (New) The apparatus of claim 32 wherein first and second ones of said dispensing nozzles are fluidly connected with first and second containers, respectively, for simultaneously delivering different liquids to respective ones of said reaction vessels.

47. (New) The apparatus of claim 46 wherein said plurality of dispensing nozzles form a first set of dispensing nozzles for dispensing a first liquid into a first set of said reaction vessels, said liquid dispenser further comprising a second set of dispensing nozzles for dispensing a second liquid into a second set of said reaction vessels.

48. (New) The apparatus of claim 47 wherein said controller is configured to simultaneously actuate said first and second sets of dispensing nozzles.

49. (New) The apparatus of claim 47 wherein said controller is configured to sequentially actuate said first and second sets of dispensing nozzles.

50. (New) The apparatus of claim 32 wherein each reaction vessel includes an ingress aperture allowing a liquid to enter into an interior of said vessel and an egress aperture for aspirating the liquid from said vessel.

51. (New) The apparatus of claim 50, said apparatus further comprising a liquid aspirator for aspirating the liquid through said egress aperture, said liquid aspirator including said rotor for carrying said vessel and orbiting said vessel about an axis of rotation, said rotor oriented generally in a horizontal plane.

52. (New) The apparatus of claim 50 wherein said apparatus further comprises an adjustment mechanism for adjusting the angle of the vessel relative to the horizontal plane in response to the centrifugal force generated by orbiting the vessel about said axis of rotation.

PRELIMINARY AMENDMENT

4 of 10

(1117372)

PATENT

Attorney Docket No. A-68711-2/RMS/VEJ
Attorney Matter No. 469249-00078
Application No. 09/881,052

53. (New) The apparatus of claim 50 wherein said reaction vessel array comprises a microtiter plate having an array of wells, wherein each said ingress aperture is an opening of a respective well.

54. (New) The apparatus of claim 53 wherein each said egress aperture extends radially outwardly with respect to said axis of rotation.

55. (New) The apparatus of claim 54 wherein said microtiter plate is formed of a porous polymeric material, wherein the porosity of said porous polymeric material forms said egress aperture.

56. (New) The apparatus of claim 50 wherein said reaction vessel array is a microtiter plate and said adjustment mechanism adjusts the angle of said microtiter plate relative to the horizontal plane in response to the centrifugal force generated by orbiting said microtiter plate about said axis of rotation.

57. (New) The apparatus of claim 32 wherein said reaction vessel array comprises a microtiter plate.

58. (New) The apparatus of claim 32 wherein each vessel is configured for containing a combinatorial-chemistry synthetic reaction, said apparatus further comprising a centrifugal motor for rotating said rotor about said central axis and moving said array of reaction vessels along said circular path.

59. (New) A method for dispensing liquids into a reaction vessel comprising the steps:

providing a rotor and a liquid dispenser, wherein said rotor is mounted for rotation about a central axis and carrying an array of reaction vessels along a circular path, and wherein said liquid dispenser includes a plurality of dispensing nozzles and is movably positioned above said rotor for movement to align said dispensing nozzles with a plurality of said reaction vessels;

PRELIMINARY AMENDMENT

5 of 10

(1117372)

PATENT

Attorney Docket No. A-68717-2/RMS/VEJ
Attorney Matter No. 469249-00078
Application No. 09/881,052

synchronizing said liquid dispenser and said rotor such that two or more of said plurality of dispensing nozzles are aligned with two or more respective reaction vessels; and simultaneously dispensing liquid into said two or more respective ones of said reaction vessels.

60. (New) The method of claim 59 wherein said plurality of dispensing nozzles are moveably positioned for movement along a portion of said circular path.

61. (New) The method of claim 59 further comprising the step of performing chemical synthesis in at least one of said reaction vessels.

62. (New) The method of claim 61 wherein said performing step comprises synthesis of oligomers.

63. (New) The method of claim 59 wherein each said nozzle comprises a dispensing valve controlling liquid delivery thereto, wherein said synchronizing step further comprises controlling said dispensing valves.

64. (New) The method of claim 63 wherein at least one of said dispensing valves comprises an electric solenoid valve.

65. (New) The method of claim 59 further comprising the step of actuating a plurality of linear actuators operably connected to said liquid dispenser for effecting movement of said liquid dispenser.

66. (New) The method of claim 65 further comprising the step of actuating said linear actuators such that said plurality of dispensing nozzles move along said portion of said circular path synchronized with said respective ones of said reaction vessels.

67. (New) The method of claim 59 further comprising the step of actuating a rotary actuator operably connected to said liquid dispenser for effecting movement of said liquid dispenser.

PRELIMINARY AMENDMENT

6 of 10

(1117372)

PATENT

Attorney Docket No. A-68717-2/RMS/VEJ
Attorney Matter No. 469249-00078
Application No. 09/881,052

68. (New) The method of claim 67 further comprising the step of actuating said rotary actuator such that said plurality of dispensing nozzles move along said portion of said circular path synchronized with said respective ones of said reaction vessels.

69. (New) The method of claim 59 wherein said plurality of dispensing nozzles are linearly arranged, said method further comprising the step of aligning said plurality of dispensing nozzles with a radial column of said array of reaction vessels.

70. (New) The method of claim 59 further comprising the step of simultaneously delivering different liquids to respective ones of said reaction vessels.

71. (New) The method of claim 70 further comprising the step of actuating said nozzles and dispense fluid while said rotor is moving along said portion of said circular path.

72. (New) The method of claim 71 further comprising the step of actuating said nozzles and dispensing fluid while said dispenser head is moving along said circular path.

73. (New) The method of claim 70 wherein said plurality of dispensing nozzles form a first set of dispensing nozzles, the method further comprising the step of delivering a first liquid from said first set of dispensing nozzles and delivering a second liquid from a second set dispensing nozzles mounted on said liquid dispenser.

74. (New) The method of claim 73 wherein first and second liquids are delivered simultaneously.

75. (New) The method of claim 73 wherein first and second liquids are delivered sequentially.

76. (New) The method of claim 59 wherein said reaction vessel array comprises a microtiter plate.

PRELIMINARY AMENDMENT

7 of 10

(1117872)

PATENT

Attorney Docket No. A-68711-2/RMS/VEI
Attorney Matter No. 469249-00078
Application No. 09/881,052

77. (New) An apparatus for performing combinatorial-chemistry synthetic reactions comprising:

a rotor including an array of reaction vessels, each vessel configured for containing a combinatorial-chemistry synthetic reaction;

a centrifugal motor for rotating said rotor about a central axis and moving said array of reaction vessels along a circular path;

a liquid dispenser including a plurality of dispensing nozzles, said liquid dispenser positioned above said rotor and arranged for movement to align said dispensing nozzles with a plurality of said reaction vessels for dispensing liquid from each dispensing nozzle into said a respective reaction vessel; and

a controller for controlling said liquid dispenser and said array of reaction vessels such that said plurality of dispensing nozzles dispenses liquid into said reaction vessels.

78. (New) The apparatus of claim 77 wherein controller synchronizes movement of said rotor and said liquid dispenser while said dispensing nozzles dispense liquid into said reaction vessels.

79. (New) The apparatus of claim 78 wherein at least one of said dispensing nozzles comprises an electric solenoid valve.

80. (New) The apparatus of claim 77 wherein said controller is configured to move said liquid dispenser synchronized with said rotor when said liquid dispenser is dispensing liquid into said array of reaction vessels.

81. (New) The apparatus of claim 77 further comprising a plurality of linear actuators operably connected to said liquid dispenser and controlled by said controller, wherein said controller is configured to actuate said linear actuators to move said plurality of dispensing nozzles.

82. (New) The apparatus of claim 77 further comprising a rotary actuator operably connected to said liquid dispenser and controlled by said controller, wherein said

PRELIMINARY AMENDMENT

8 of 10

(1117372)

PATENT

Attorney Docket No. A-68717-2/RMS/VEJ
Attorney Matter No. 469249-00078
Application No. 09/881,052

controller is configured to actuate said linear actuators to move said plurality of dispensing nozzles.

83. (New) The apparatus of claim 77 wherein said plurality of dispensing nozzles are arranged in a pattern matching the of array of reaction vessels.

84. (New) The apparatus of claim 77 wherein said reaction vessel array comprises a microtiter plate.

85. (New) A method for performing combinatorial-chemistry synthetic reactions comprising the steps of:

providing a rotor, a centrifugal motor and a reagent dispenser, wherein said rotor includes an array of reaction vessels, each vessel configured for containing a combinatorial-chemistry synthetic reaction, wherein said centrifugal motor rotates said rotor about a central axis and moves said array of reaction vessels along a circular path, and wherein said reagent dispenser including a plurality of dispensing nozzles, said reagent dispenser being positioned above said rotor and arranged for movement;

synchronizing said reagent dispenser and said rotor to align said dispensing nozzles with a plurality of said reaction vessels;

dispensing reagent from at least one of said dispensing nozzles into said a respective reaction vessel.

86. (New) The method of claim 85 further comprising the step of actuating said nozzles and dispense fluid while said rotor is moving.

87. (New) The method of claim 86 further comprising the step of actuating said nozzles and dispensing fluid while said dispenser head is moving.

88. (New) The method of claim 85 wherein said reaction vessel array comprises a microtiter plate.

PRELIMINARY AMENDMENT

9 of 10

(1117372)